

careful discrimination. The effects should not be lumped together as due to suddenness.

A good deal of space is devoted to what the author terms "true stresses." He takes the well known strain equations $E\epsilon_1 = S_1 - \lambda S_2 - \lambda S_3$, &c., and, because $E\epsilon_1$ is of the same form as stress in terms of extension, he calls $E\epsilon_1$ the "true stress" due to the "apparent stresses" S_1, S_2, S_3 . This is to use the term "stress" in a totally new sense. The real stresses which balance the external forces are only "apparent stresses"; an imaginary stress which is greater is the "true stress." It is impossible here to follow the author to the curious results he arrives at, which involve a revision of all the ordinary formulas of strength. It is not difficult to see from what point he has drifted. He throughout implicitly assumes that the condition of security in a structure depends on the maximum stress. He nowhere discusses the other views which have been taken. Now one of these is that security depends, not on maximum stress, but on maximum strain. What the author does with his equations is to make security depend on the maximum strains ϵ_1 , &c.; but this does not justify him in calling $E\epsilon_1$ a true stress.

A HANDBOOK OF FLOWER BIOLOGY.

Handbuch der Blütenbiologie. Vol. iii. Part ii. By Ernst Loew, assisted by Otto Appel, completing the work commenced by Paul Knuth. Pp. v+601. (Leipzig: Wilhelm Engelmann, 1905.) Price 18s. net, in paper cover.

THE work which the late Prof. Knuth projected and commenced—a "Handbook of Flower-Biology," to replace Hermann Müller's "Fertilisation of Flowers"—is now complete. It runs as follows:—vol. i., an advanced text-book of flower biology; vol. ii., an account of observations made in Europe (two parts); vol. iii., an account of observations made outside Europe (also two parts).

Ernst Loew, who, after Knuth's death, undertook the completion of the work, appends to the last part a review of the collected extra-European observations.

There can be no doubt of the preeminent fitness of Dr. Loew for his task; but the result on close criticism is found just a little disappointing on account of omissions, e.g. Willis's observations on *Phacelia*, *Monarda*, and *Ixora*, and Keeble's on *Loranthus*, incorrect citations—at the rate of one per page in the literature-list—an imperfect index, far too many printer's errors, and illustrations not always, I believe, drawn from the living flower.

Dr. Percy Groom (*NATURE*, vol. lxxi. p. 26) remarked on omissions and printer's errors in reviewing the preceding part of this work.

Of the body of the work, it is to be said that, besides abstracting all pertinent publications that have fallen into Dr. Loew's hands, it gives to the world a considerable number of original observations made by Knuth in Java, Japan, and California, and a few of Loew's made in the Berlin Botanic Garden, and that the names of North American insects have been subject to a revision by Prof. Robertson, of Carlinville, Illinois.

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Of the review, it is to be explained that it centres on a discussion of the fertilising agents in countries outside Europe. I greatly appreciate the vast amount of labour which Dr. Loew has put into it. He could hardly have made greater use of the fragmentary material to hand. But the account of fertilisation in the tropics wants atmosphere; it is such as a man would write who had no particular experience of their vegetation. Twelve pages of the review are given to this account: first, Dr. Loew borrows from Prof. Warming a description of the vegetation of Lagoa Santa, in Brazil; then he goes on very successfully to discuss the part which birds play in fertilising flowers. In the place of the description of Lagoa Santa, one had hoped to find a more general description of tropical seasons. Nearly twelve pages are given to an account of fertilisation in New Zealand and the Antarctic islands—chiefly to a comparison of Arctic and Antarctic flowers, wherein Loew sees less agreement than does Delpino. Four and a half pages are given to South Africa with Madagascar—an ill-assorted union, three to the cactus region of N. America, six to the Arctic region including Spitzbergen, and twenty-six to the forest belt of N. America. I have here set down the number of pages devoted to each region because they rightly indicate the proportion in which the regions have been studied.

In dealing with the forest belt of N. America, Loew depends, of course, on Robertson's excellent work; there alone he really finds facts enough to enable him to work in the statistical methods which he has used so extensively in his writings regarding European flowers.

A time will come when the botanists of North America ask for a handbook of North American flower biology. Loew's work shows how far from readiness is material for it, and how very much further from readiness is material for a handbook of flower biology for any other part of the world. Until we get such handbooks, Loew's volume of Knuth's work will remain very useful on account of its suggestions, its references, its information, and especially as a companion in travel. I. H. B.

A FRENCH BOOK ON SPORT AND TRAPPING.

Chasse, Élevage et Piégeage. By A. de Lesse. *Encyclopédie Agricole.* Pp. xii+532; illustrated. (Paris: J. B. Baillière and Son, 1905.) Price 5 francs.

THE volume before us is one of a series dealing not only with subjects pertaining to agriculture in its proper and more restricted sense, but likewise with practically everything connected with country life which has any bearing at all on that pursuit. In the present instance, the subject of the trapping and snaring (*piégeage*) of animals, which, in the case of noxious species is, of course, a matter of considerable importance to the agriculturist, serves to establish a connection between sport (especially in the French sense of that term) on the one hand and agriculture on the other, and thus justifies the inclusion of the volume in the series. In connection

with the subject of trapping and snaring, we may take occasion to remark that the agitation which has been set on foot in this country against traps of an unduly cruel nature (indeed, against "gin-traps" of all kinds) does not appear to have reached the other side of the Channel, or, at all events, does not seem to have had any effect there. For in the present volume there is a cut of an unfortunate falcon ensnared in one of the abominable pole-traps, without a word of condemnation of snares of that description (unnecessarily cruel from the fact that they are in many cases only visited at long intervals).

The volume commences with a series of chapters pointing out the commercial importance of "la chasse," first as a source of revenue to the State, then as a source of food-supply, next in connection with rendering unfertile tracts profitable, and finally in relation to the rural population. The second section of the volume is devoted to game protection and the natural and artificial rearing of game birds, in the course of which the English and French methods of pheasant breeding are contrasted and their relative merits compared. Sporting dogs—other, of course, than hounds—form the subject of the third section, which is illustrated with a number of cuts (not by any means always of the best) of some of the chief breeds, and the manner of training dogs for their special duties. Then comes a dissertation on the various methods of destroying animals commonly classed as injurious to the game-preserver and the agriculturist, in the course of which, as already mentioned, every kind of trap and gin, no matter how cruel, is described in detail, while the reader is also instructed in the various methods of employing fire-arms and poison for the same end. The more legitimate forms of sport, including, however, small-bird-shooting and rabbit-netting, together with an account of the legislation connected with the subject, form the concluding sections of the volume. The whole subject of "la chasse" or "le sport" is viewed so differently by our French neighbours and by ourselves, that it is somewhat difficult to give an unbiased opinion on the merits of the volume before us. Probably, however, it is thoroughly well suited to the class of readers for whom it is specially intended, although we cannot but regret that an attempt was not made to inculcate more humane views in the matter of the destruction of so-called noxious animals.

R. L.

OUR BOOK SHELF.

Ergebnisse und Probleme der Elektronentheorie. By Prof. H. A. Lorentz. Pp. 62. (Berlin: J. Springer, 1905.)

This book contains a lecture given by Prof. H. A. Lorentz before the Elektrotechnischen Verein at Berlin, December, 1904, to which certain additions have been made. It is a most interesting semi-popular account of the present position of the electron theory, which is due largely to the author.

The lecturer begins with a short historical introduction, and then goes on to discuss the properties of kathode rays, which, of course, are negative electrons. He describes the methods by which the ratio of the mass to the charge of these rays has been

determined, and Kaufmann's beautiful research on the β rays from radium, which, in conjunction with J. J. Thomson's and Abraham's theoretical investigations, has led to the conclusion that the mass of these rays or electrons is entirely electromagnetic in its origin.

The most interesting part of the lecture now follows, where a description is given of the electron theory of the conductivity of metals. The beginnings of the electron theory of metallic conductivity we owe to Weber and Kohlrausch, and its recent developments to Riecke, Drude, and J. J. Thomson. Lorentz here adopts J. J. Thomson's view, that the conductivity of metals is entirely due to the presence in them of freely moving negative electrons, and that the positive electrons are practically fixed, and so do not contribute to the conductivity. Riecke and Drude have so far supposed that both the positive and negative electrons move. The lecture contains an interesting discussion of the special difficulties of these rival hypotheses, neither of which has yet been made to fit in with all the facts.

According to the electron theory of metallic conduction, the electrons move about between the metal atoms so that they are practically in the gaseous condition and the results of the kinetic theory of gases can be applied to them. On these assumptions the ratio of the conductivity for heat to the electrical conductivity can be calculated, and the result is that

$$\frac{k}{\sigma} = \frac{4}{3} \left(\frac{e}{e} \right)^2 T,$$

where k =heat conductivity, σ =electrical conductivity, T =absolute temperature, e =charge carried by one electron, and a =the gas constant. According to this equation, k/σ should be the same for all metals and proportional to the absolute temperature. The experimental results so far obtained agree on the whole very well with these conclusions, and form a striking confirmation of the general truth of the theory. The observed absolute value of k/σ also agrees fairly well with that calculated by means of the formula just given.

The electron theory also gives a fairly satisfactory explanation of the phenomena of thermoelectricity and contact potential difference, but it is very difficult to reconcile completely with the facts on the Hall effect. H. A. Lorentz's lecture shows that many problems of the electron theory still await a solution, but it also shows the immense progress which has recently been made, and suggests the idea that very soon nothing but ether and electrons will be retained in our conception of the physical universe. H. A. WILSON.

Die elektrischen Bogenlampen, deren Prinzip, Konstruktion und Anwendung. By J. Zeidler. Edited by Dr. G. Benischke. Pp. x+143. (Brunswick: Friedrich Vieweg und Sohn, 1905.) Price 5.50 marks.

THE book published under the above title forms the sixth pamphlet of "Elektrotechnik in Einzeldarstellungen." The author divides the contents into four parts. In the first one he shows great ingenuity in classifying lamps; he also explains the actions of series, shunt, and differential arcs, and describes the precautions which are necessary to ensure steady burning.

In the second part we find the constructions of various types of arc lamps, the sizes of carbons to be used, the advantages and disadvantages of flame and enclosed arcs, and an article on inverted lamps.

The third part deals with the distribution and calculation of light. It describes the construction of polar and Rousseau curves, the meaning of hemispherical intensity, the power-factor of alternate current flame